RESPIRATION INVESTIGATIONS ON SUDD SOILS

by

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Introduction

The last larger, several square kilometers extending remains of – Hungary's once very largely extended – sudds (swimming insel or bog) can be found in the western basin of Lake Velencei forming an almost entirely closed stand.

Three large canals were excavated into it:

- as first the Kajtor-canal draining the "superflous" water of the lake,
- later on the Kuti-groove serving the communication to the "Bird Sanctuary" being a protected area,
- finally the Császárvíz-brook providing the principal watersupply to the lake, got a wide deep artificial bed.

The dams of the very wide Kajtor-canal and Császár-canal were made in the sudd-area from the turf of the sudds, on both sides of the Kuti-groove the turf was deposited in prisms along the edges of the sudds rimming the canal.

In comparison to this, there is a much greater sudd-destruction in course in the eastern basin of the lake, between the villages Agárd and Velence under the concept of "reed control". Large prisms are built into the water of the lake from the turf of these sudds which emerge several meters high above the water level.

The aim of our work was to establish how speedy is the decompositional process (soil respiration) of the different layers of the sudd's turf soil and the "kotu" – i.e. of the turf lost its water content, permeated by the air, oxidizing, – to may establish by this:

- is the turf utilizable as hydrotechnical material?
- do the large turf prisms, oxidizing above the water level and thus converting into kotu, constructed for aquatic environmental protectional purpose, cause environmental problems in the lake? (Fig. 2/5)

In order to realize our aim, it seemed the most suitable to measure the CO_2 production of the matters to be investigated.

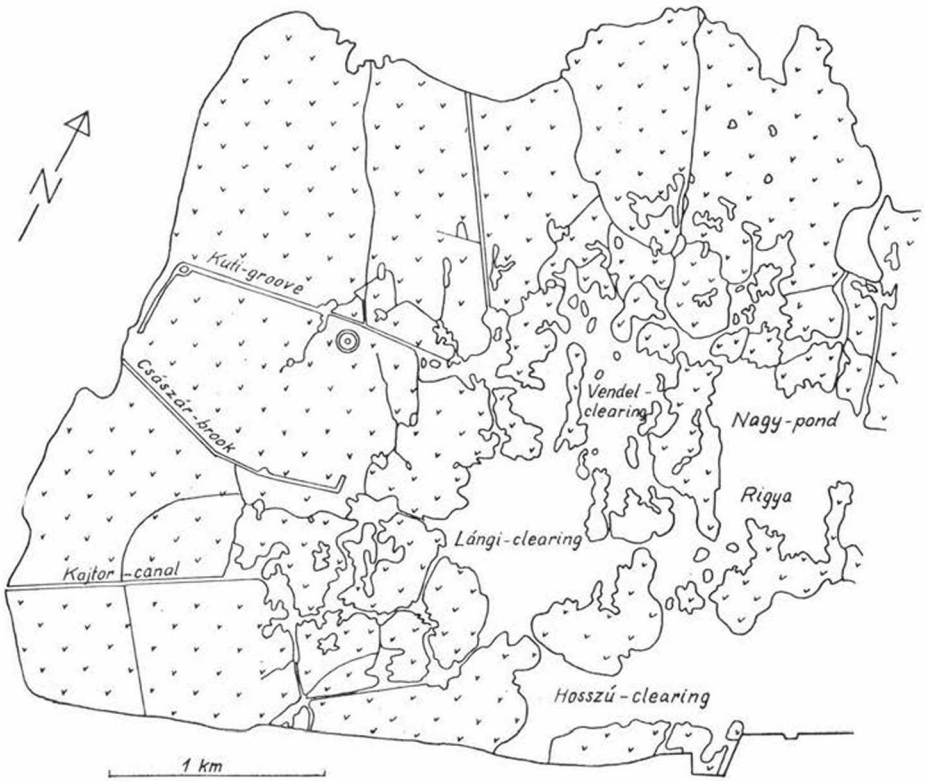

Fig. 1 Map of the western basin of Lake Velencei (Hungary) indicating the sampling spot

Place, time, matter and method of our investigations

We took our soil-samples along the Kuti-csapás (groove) and in the reed zone between the groove and the Pyrolan woods. In the proximate vicinity of our sampling spots several years old kotu piled up on the banks of the canal (groove) was disposable too, which comes from a sudd-part being of the same age, thickness and consisted of the same plants as our soil-samples.

We carried out our investigations on the 10th October, 1978.

From the soil of the sudd we lifted a 50 cm deep monolith. The structure of this soil-monolith is not homogenous. On the top there is a 10 cm thick, dense, dry litter-layer above the proper soil. Below the proper soil surface (and the water table) a 10 cm thick layer is weawed through densely, feltlike by the roots of the marshy plants consisting the herb layer. Underneath this level only the roots of the reed and bulrush penetrate.

The root-zone of the marshy plants segregates sharply from the turf-layer below it. If we catch the root-zone of the soil-monolith lifted out

and shake it strongly, the turf-block easily falls down. The on and on deeper turf layers are more homogenous, the recognizable plantal part is ever less in them.

We took three – three samples: from the litter-zone, from the root-zone, from beneath the root-zone in 30 cm depth counted from the surface as from the more mature turf in 50 cm depth. The cotu samples (see Fig. 2 : 5 ; 3 samples) were taken from the kotu prism heaped along the canal shore, from 10 – 20 cm depth.

The CO_2 production of the samples were measured by the FREWIL apparatus. This very sensitive apparatus measures exactly even the fractions of the μg CO_2 quantities (F r e n y ó 1974, 1974a). The apparatus has been tested succesfully also for measuring the soil respiration (F r e n y ó - K o v á c s 1976). In course of our work we measured how many is needed to the production of 1 μg CO_2 on 1 cm^2 soil surface.

Table I

Productional time of 1 μg CO_2 on 1 cm^2 soil surface

turf (50 cm)	> 600 sec	> 600 ses	> 600 sec
turf (30 cm)	> 600 sec	> 600 sec	> 600 sec
root-zone	275 sec	292 sec	444 sec
litter	64 sec	66 sec	59 sec
kotu	46 sec	46 sec	49 sec

Results

The turf layers underneath the root-zone produced scarcely within 10 minutes almost the fraction of a μg, teher exist decompositional processes in them almost none. In the root-zone 1 μg CO_2 got produced on 1 cm^2 surface within several minutes until the same happened on the dry litter-layer in 1 minute, on the oxidizing turf within less than 1 minute.

Our investigations prove that the turf – as an organic rock forming a special geomorphological formation, namely the sudd, – is practically lifeless. The decompositional speed of the mature turf being in touch with the water comes near to zero – thus the plantal nutrient load reaching the lake is disconnected for geological eras from the nutrient turnover of the lacustric ecosystems. If in contrary the turf originating from the deterioriation of the sudd is piled up in the lake, not only the water quality preserving role of the sudd is stopped, but within few years the during the geological times accumulated plantal matters are deliberated and made accessible to the matter circulation of the lacustric ecosystems. The thus originating organic matters cause such a nutrient load that with it even the original sudd-world cannot overcome, not least the artificially decreased one.

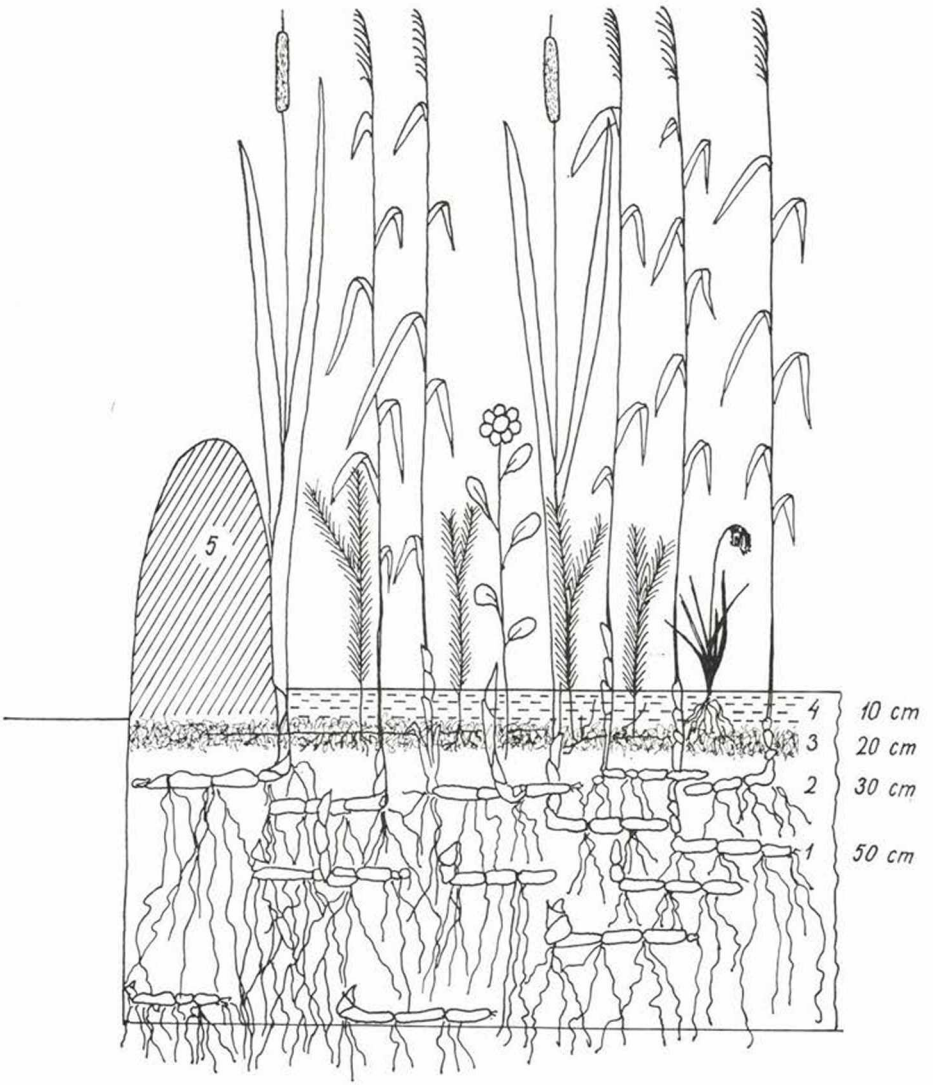

Fig. 2. Cross-section of the sudd on the sampling-spot

We may establish thus:

– the turf is not suitable for the hydrotechnical constructions as a hydrotechnical material,

– the piling up of the turf in the lake originating from the reed-control (i.e. destruction) is a serious environmental damage.

Summary

The authors measured the CO_2 production of the different layers of the sudd soil (as the litter-, root-, young and mature turf-zones) and that of the kotu (oxidizing turf being in a fried, air-penetrated, decompositing consistence) by the very sensitive FREWIL apparatus.

They experienced that the turf-layer of the sudds does not show almost any life activity, in the root-zone it is slow, in the litter-zone it is speedy enough, in the kotu the carbon dioxide productions is however more faster.

From this the authors conclude that the basic rock of the sud-soil is practically lifeles, the plantal nutrient loads reaching the lake in it are disconnected for geological eras from the nutrient circulation of the lacustric ecosystems; thus the sudd protects the lake from the eutrophication. The process becoming kotu is in turn a very fast process, by it the nutrients accumulated till geological eras can load the lacustric ecosystems within very short interval. Therefore the authors disapprove the exterminations of the sudds and the piling up the oxidized turf in dumps from the destructed sudds in the water of the lake.

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